Gibson Ridge (GRLevelX) Weather Radar Software

Reference(s): GRLevelX User Guides/Manuals; Local Policy.

Purpose: Provide basic operating procedures to properly manipulate the Gibson Ridge radar software GRLevel 3 (GR3) and GRLevel2 Analyst (GR2A).

Procedures:

1. **Software Configuration:** Separate guidance for configuration of the software on the Fort Hood network is located on the 3 WS Shared Drive (*WOC/GRLevel*):

GR2A_Config.pptx

GR3_Config.pptx

2. **GRLevel3 (GR3)**: A Windows viewer for live NEXRAD Level III data from the NWS Radar Product Central Collection Dissemination Service. It displays high resolution base products, dual polarization products, and derived products along with Local Storm Reports and severe weather warnings for any radar site across the country. The user can easily roam and zoom with just a click of the mouse to display smoothed radar data at high resolution. ==*Refer to Attachment 1 for basic operating procedures.*==

3. **GRLevel2 Analyst (GR2A)**: An advanced NEXRAD Level II data analysis application. It allows users to more intensely interrogate potentially severe storms through the ability to easily create cross-sections of any of the base Level II data products (reflectivity, velocity, storm relative velocity, and spectrum width). In addition, the GR2 Analyst also derives five high resolution 2D products from the Level II volume reflectivity data (Echo tops, VIL, VILD, POSH, and MEHS). ==*Refer to Attachment 2 for basic operating procedures.*==

4. **Troubleshooting/Backup**.

    a. If you encounter problem downloading data, change the polling server to the back-up server. For example, for the GR2A, change from the AFWA server to the *iastate.edu server*. During duty hours only, if you still encounter problems, contact the Flight NCOIC and/or the Flight Commander, or Mr. Ortner.

    b. If you have any issues/questions, please send an E-mail to Mr. Ortner.

    c. **Back-up:** Use CU or NWS websites as back-up source for radar data (i.e., 26 OWS, AFW-WEBS).

5. **Radar Interpretation Techniques/Information/Training.**

    a. Refer to the *3 WS Radar Interpretation Guide* for quick reference information and techniques to aid in the identification, interrogation, and forecasting of meteorological phenomena using the Gibson Ridge radar software. A printed version in a binder is also located in the weather station forecast area.

    b. Refer to **557 WW/TN-15/001**, *Interactive Meteorological Techniques*, on-line version. Specifically, view the **Doppler Radar** section under the "Miscellaneous Elements tab.

    c. Refer to **26 OWS Radar Imagery Reference File (RIRF)**.

    d. Refer to the **Air Force Weather Knowledge Center (AFWKC)** for various courses and reference material.

    e. Refer to the **FMH-11-Part B** for general information on Doppler radar theory and meteorology or **FMH-11-Part C** on WSR-88D products and algorithms:
                  http://www.ofcm.gov/fmh11/fmh11.htm

3 Attachments:
1. **GR3** Basic Operating Procedures
2. **GR2A** Basic Operating Procedures
3. VCP Comparison Table

DISTRIBUTION: See SOP Table of Contents   Reviewed: _____

Attachment 1
GRLevel3 (GR3) (Version 2.XX)

1. **Getting Started.** Refer to configuration instructions (**GR3_Config**) if opening the program on a Fort Hood network computer for the first time.

    a. Click applicable icon on the desktop or open viewer through the Start/Programs menu.

    b. The main window contains a main menu along the top, toolbar underneath, color table on the left, radar display window in the center, and the status bar along the bottom.

    c. Many layers of information are shown in the **radar display window** (from back to front order): background color, automatic background imagery, radar graphical data, county outlines, state outlines, roads, city labels, radar labels, LSR icons, warning outlines, storm tracks, hail icons, NMD/MESO icons, and finally TVS icons.

    d. **Background.** If the automatic background is enabled (via GIS->Show Background) you will see increasing levels of detail as you zoom into the radar display. GR programs automatically download and display high-resolution background imagery from public WMS servers. There are three sources for the background imagery: BMNG, Landsat, and NAIP. (Refer to http://www.grlevelx.com/manuals/background/ for more details.)
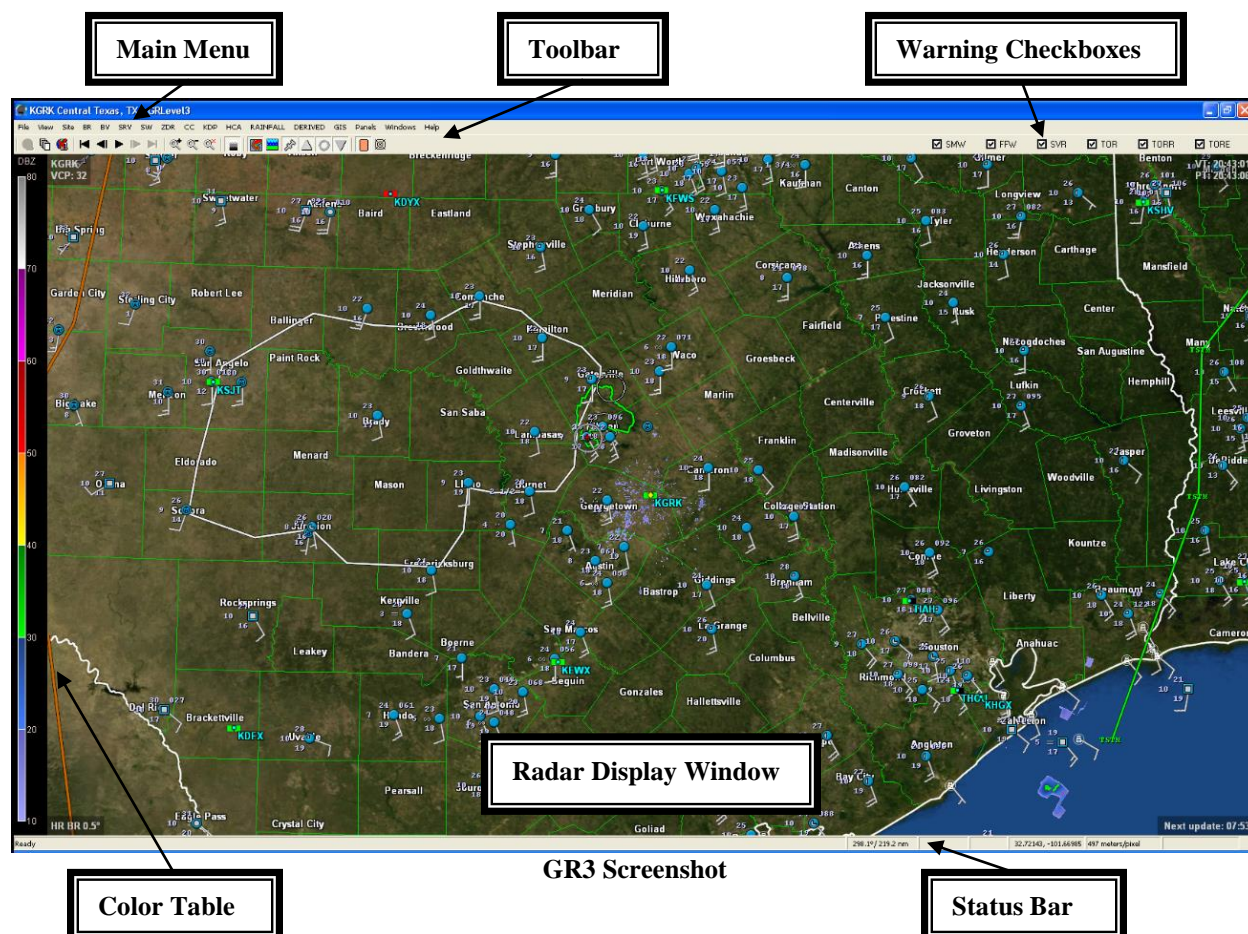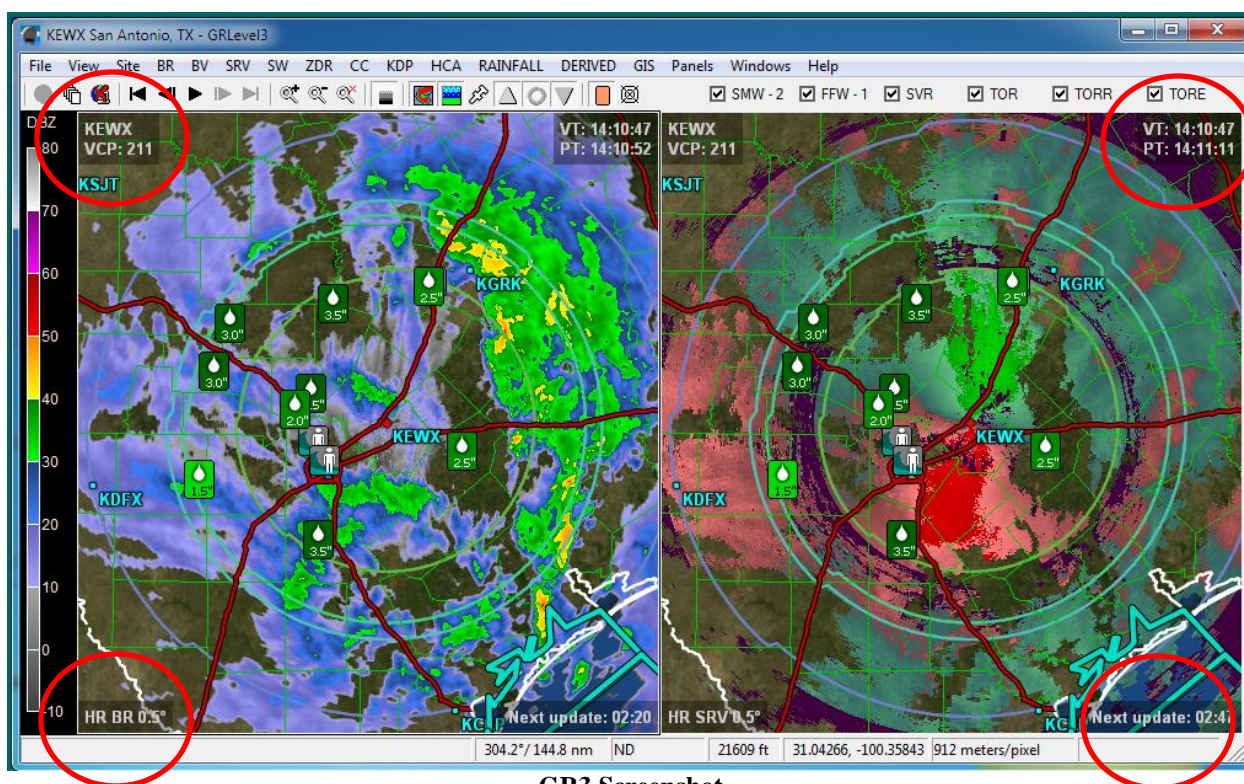

GR3 Screenshot

2. **Radar Display Window.** The radar display window is the centerpiece of GR3. By default it contains a single display panel, but can display one, two, or four panels. Each display panel shows radar data, LSRs, warnings, and other graphical information. All of the panels are linked together, so panning and zooming occurs simultaneously in all of them. In the screenshot below, BR 0.5° is the product shown in Panel #1 (left) and SRV 0.5° in Panel #2 (right).

    a. In the four corners of each panel is information about the data:

        (1) Upper-left shows the radar and VCP (refer to attachment 3 for VCP information).

        (2) Upper-right contains the Volume and Product Times.

        (3) Lower-left shows the product displayed.

        (4) Lower-right shows the amount of time until the next update is expected.


GR3 Screenshot

    b. **Panels**. To change the number of display panels shown, click the "Panels" main menu item and select "One Panel", "Two Panels", or "Four Panels." Below those items are saved Favorite Panel configurations. There are eight saved Favorite Panel configurations available and they default to a variety of useful combinations. There are two ways to switch to a saved Favorite Panel configuration: select it from the Panels menu or press the corresponding number key on your keyboard. To replace a saved Favorite Panel configuration with the current displayed panels, select Panels->Save Current Panels as->Favorite #N, where N is the saved configuration to replace.

3. **Navigation in the Radar Display Window.**

    a. **Pan** - To pan the display, click and drag with the left mouse button.

    b. **Zoom** - To zoom in, roll your mousewheel forward or click the   icon on the Toolbar.

To zoom out, roll your mousewheel backwards or click on the   icon on the Toolbar. To zoom in on a specific area, right-click on the location you want centered and drag outwards. A zoom box will appear showing the extent of the new view area. Release the right mouse button to activate the new zoom area. To cancel the right-click zoom operation, press the Esc key before releasing the right mouse button.

4. **Animation**. Use the VCR buttons located on the **Toolbar** to manipulate a loop or pause on the most current image for interrogation. To adjust the speed of the loop, click on "View," "Animation Settings" and adjust the settings.
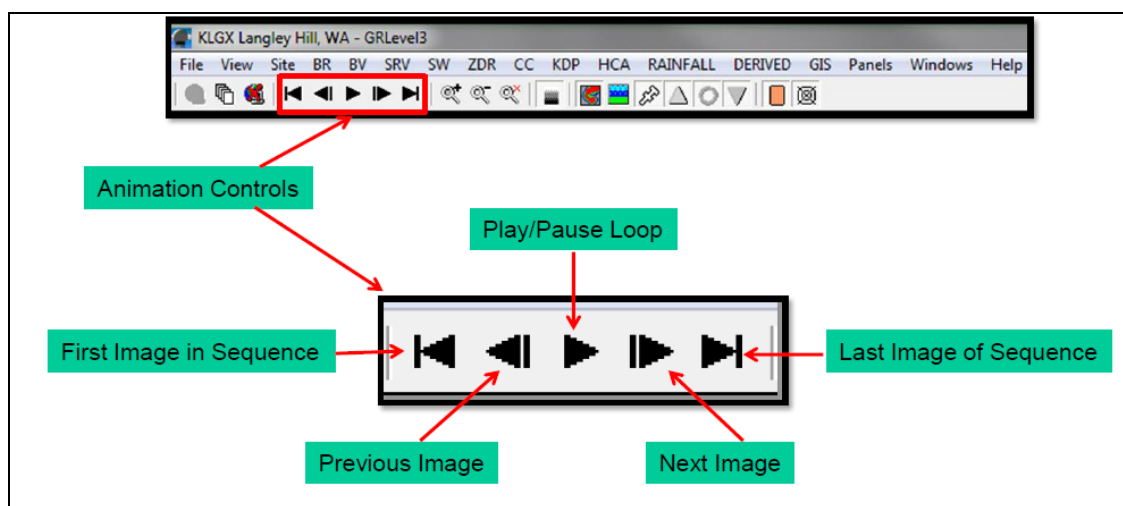
5. **Panel Graphic Controls (Toolbar).**
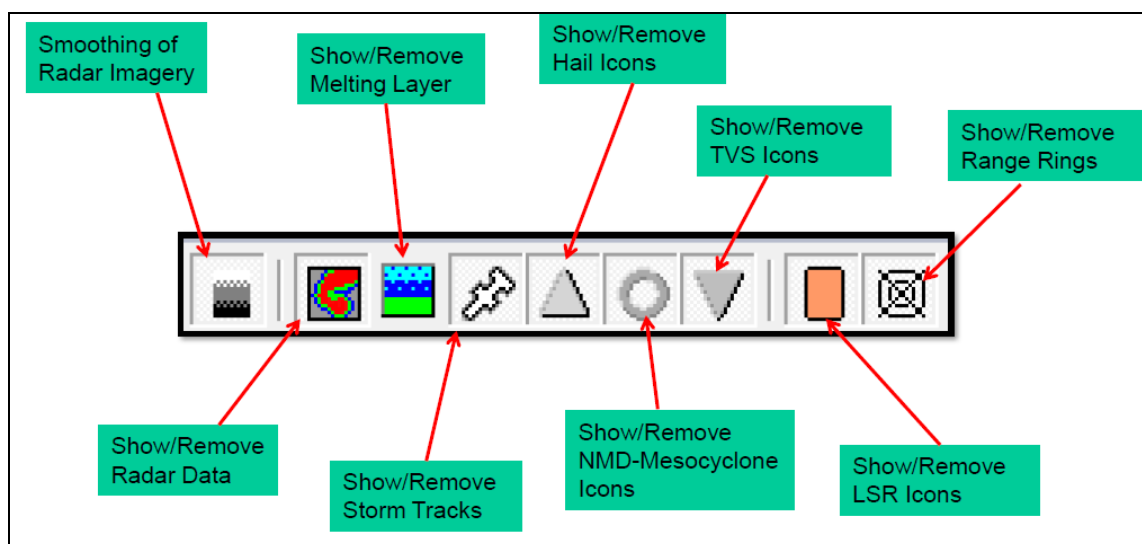
6. **Selecting Different Radar Products**.

  a. Base Reflectivity (BR) 0.5° is the default radar data product. To select a different product, click on the product's category in the main menu (i.e., BR, BV, SRV, etc.) and select the specific product of interest from the submenu. GR3 automatically starts/stops polling for products as you switch between them. GR3 uses dynamic polling based on product(s) selected.

  b. **Radar Products.**

   (1) GR3 displays all significant Level III radar products for both legacy and Dual Pol NEXRADs and TDWRs. Due to the mix of legacy, high resolution, and Dual Pol data streams, GR3 works with categories of products. **There are 14 categories (refer to Table below).**

BR	Base Reflectivity	Reflectivity is one of the fundamental radar products
BV	Base Velocity	Base Velocity is a fundamental Doppler radar product
SRV	Storm Relative Velocity	Base Velocity with the storm motion removed
SW	Spectrum Width	The amount of variability in the base velocity
ET	Echo Tops	Height of the 18 dbz reflectivity
VIL	Vertically Integrated Liquid	Estimate of liquid in a vertical column of reflectivity
OHP	One Hour Precipitation	Estimate of how much rain has fallen in one hour
STP	Storm Total Precipitation	Estimate of how much rain has fallen in an entire event*
ZDR	Differential Reflectivity	Dual Pol product comparing the horizontal and vertical reflectivity
CC	Correlation Coefficient	Dual Pol product measuring the variability of echoes
KDP	Specific Differential Phase	Dual Pol product measuring liquid content in echoes
HCA	Hydrometeor Classification Algorithm	Dual Pol product estimating the type of echoes
DOD	One Hour Difference	Dual Pol product showing the difference between Dual Pol and legacy algorithms for One Hour Precipitation
DSD	Storm Total Difference	Dual Pol product showing the difference between Dual Pol and legacy algorithms for Storm Total Precipitation

**GRLevel3 Categories of Radar Products**

*NOTE: Scroll the cursor over the **STP** product label bottom left corner of the display to view the applicable time period of the product (Start/End times) and algorithm bias.
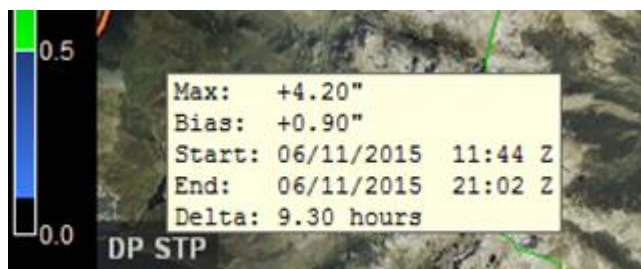
STP Product label (lower-left corner)

   (2) GR3 always chooses the highest quality product from each category. For example, on a Dual Pol NEXRAD, GRLevel3 displays the Dual Pol version of Storm Total Precipitation instead of the legacy product.

(4) **Vertical Wind Profile (VWP)**. Select "Windows" in the top **Menu Bar** and select "Show VWP Window." The VWP will be displayed in a separate window that can easily be re-sized by "click and drag" a corner and can be "dragged" around the screen.
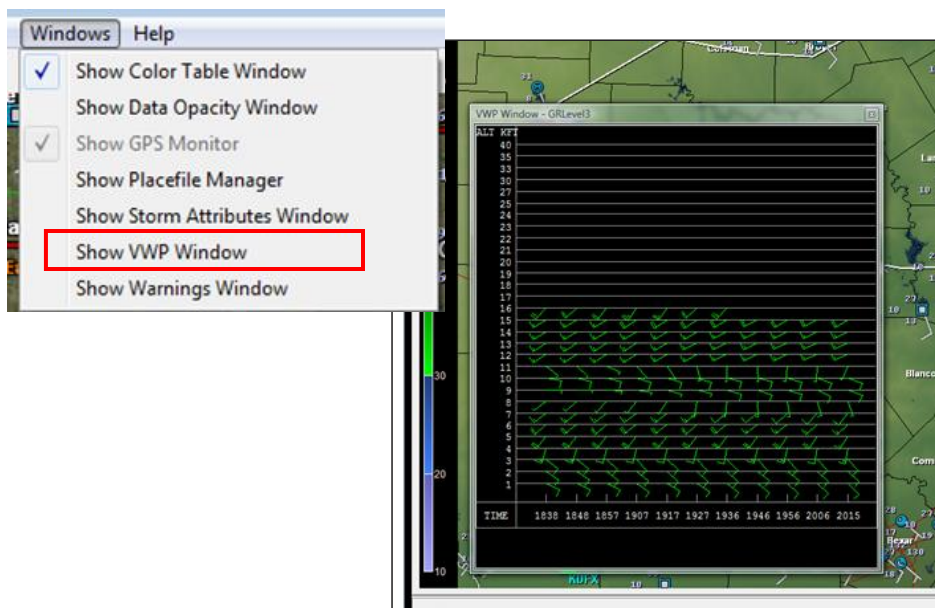

Vertical Wind Profile (VWP)

7. **Changing Radar Sites.**

   a. There are two ways to change to a different radar site:

        (1) If the radar site is shown in the radar display window, hover the mouse pointer over the site's location and when the mouse pointer turns to a "hand" cursor, click left mouse button.

        (2) Select "Site" item from the main menu. The "Select Radar" dialog will appear, showing a list of all the supported radars.

    b. When the radar site is loaded for the first time, only the current product is loaded. The "Archive" icon must be selected to load previous images (volume scans) to enable a loop to be displayed (the default is one hour).
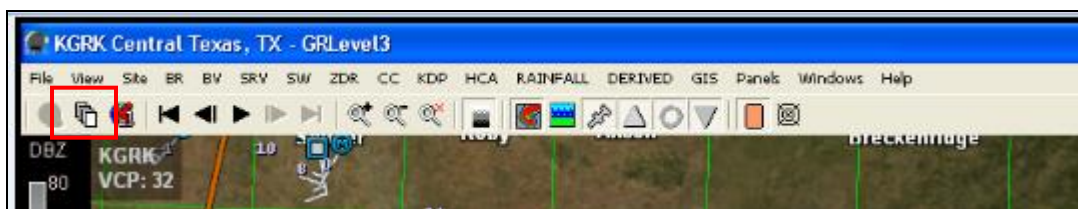
8. **Status Bar Window**: At the bottom of the screen the user can view the current cursor location (direction distance from the radar or selected home), lat/lon, radar beam elevation, Next Product Update, etc. When the cursor is placed on a storm the product details (i.e., cloud top, reflectivity, VIL value, etc. will be displayed on the bar. In addition, highway/road identification will also be displayed in the lower left-hand corner when the cursor is panned across most roads.
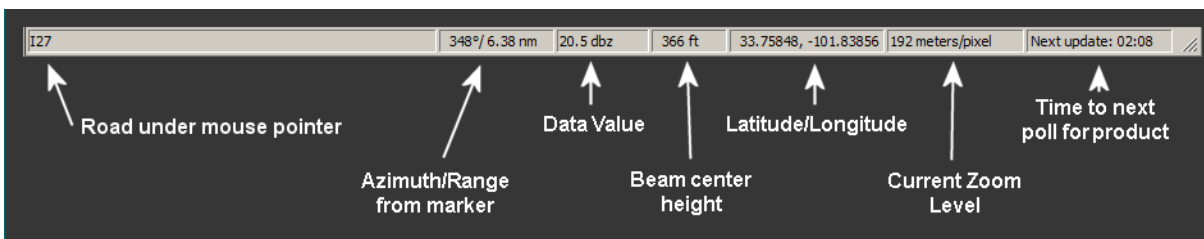
Status Bar Window

9. **Change Home**: Place the cursor where you desire to measure direction/distance from (i.e., RGAAF) and right click; select "Place Home Here." Direction and distance displayed on the Status Bar will now be based off of this location.
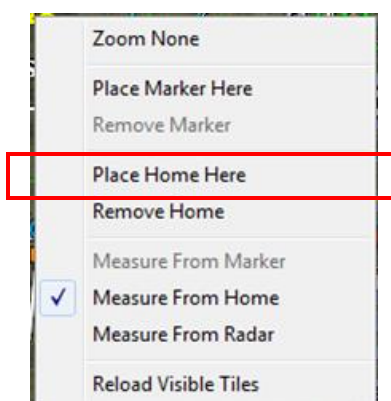
Right-click Context Menu

10. **Warnings**.

   a. GR3 downloads severe weather warnings for the entire nation:

      (1) Special Marine Warning (**SMW**)

      (2) Flash Flood Warning (**FFW**)

      (3) Severe Thunderstorm Warning (**SVR**)

      (4) Tornado Warning (**TOR**)

      (5) Tornado Emergency (**TORE**)

      (6) Tornado Warning that has a report of a tornado (**TORR**)

b. GR3 shows a priority-sorted list in the "Active Warnings" window and the warning outline in the radar display window. You can view the statements for a warning in two ways: click on the warning outline in the radar display or right-click on the warning's entry in the Active Warnings window (see below).

c. **Active Warnings Window**. The Warnings window displays a list of all the active warnings across the nation. To automatically change to the closest radar site to a warning, double-click on the warning's entry in the Active Warnings window.

Active Warnings Window

11. **Local Storm Reports (LSRs).** GR3 downloads Local Storm Reports from the public NWS server. Icons representing the type and magnitude of an LSR are shown in the radar display. Hover your mouse pointer over an LSR icon to see details of the report. Only LSRs issued within 60 minutes of the currently displayed product's volume scan time are shown.

12. **Placefiles**. These are separate data files used to customize the GR3 (and the GR2A) data display. They consist of dynamic files such as lightning data, METAR observations, storm reports, and other live data. They also consist of static files such as the outlines for the Fort Hood Reservation and the WTA—overlays that don't change.

a. Select "Windows" on the **Menu Bar** and select "**Show Placefile Manager**." A separate window will appear.
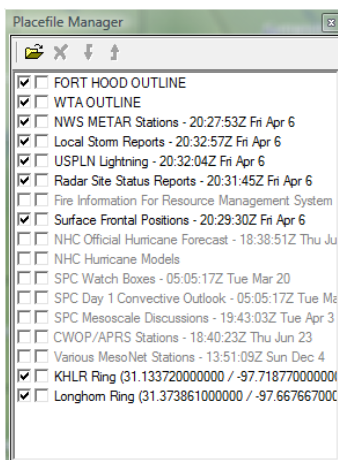
Placefile Manager Window

b. Select or deselect the desired data type to be displayed by clicking in the applicable box.

13. **Saving an Image.** Select **File**, **Save Image**, and select the desired display you want to save. You can save a screenshot of the entire GR3 window; the color table and the radar display; or the radar display only.

14. **Archive Data.** GR3 can display archived data from the NCDC NEXRAD Data Inventory Search http://www.ncdc.noaa.gov/nexradinv/.

    a. Follow NCDC's archive data request instructions and once their E-mail is received, follow the instructions to view the archive data files.

    b. Save the files you wish to view on to your computer.

NOTE: It is best to have two screens so you can drag/drop the file into the GR display window.
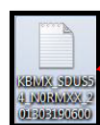
Download the file by right clicking and Save link as… on your computer. This will save a .txt file of the image that you requested.

    c. Ensure the active display window is set to the image you wish to view. For example, ensure that BR 0.5° is first selected before attempting to view the BR 0.5° archive data file.

Align the display window with the data to be viewed, then drag and drop the saved file anywhere within the radar display window.
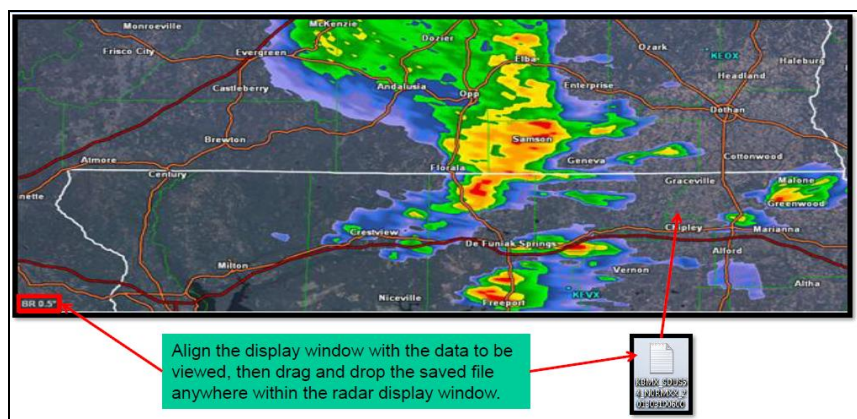
15. **On-line GRLevel 3 User Guide: http://grlevelx.com/manuals/grlevel3_2/**.

Attachment 2
GRLevel 2 Analyst (GR2A) (Version 2.21)

1. **Getting Started.** Refer to setup instructions (**GR2A_Config**) if opening the program on a Fort Hood network computer for the first time.

NOTE: Many of the features within GR2A are similar to GR3 (i.e., changing radar sites, animation, change home, etc.)—refer to Attachment 1 for these functions. The instructions below detail the unique features/functions of the GR2A software.

    a. Click on applicable icon on the desktop or open viewer through the Start/Programs menu.

    b. The main window contains six components: **Main menu** along the top**, Main toolbar** underneath, **Color table window** on the left, **Radar display window** in the center, **Information window** on the right, and the **Main status bar** along the bottom.
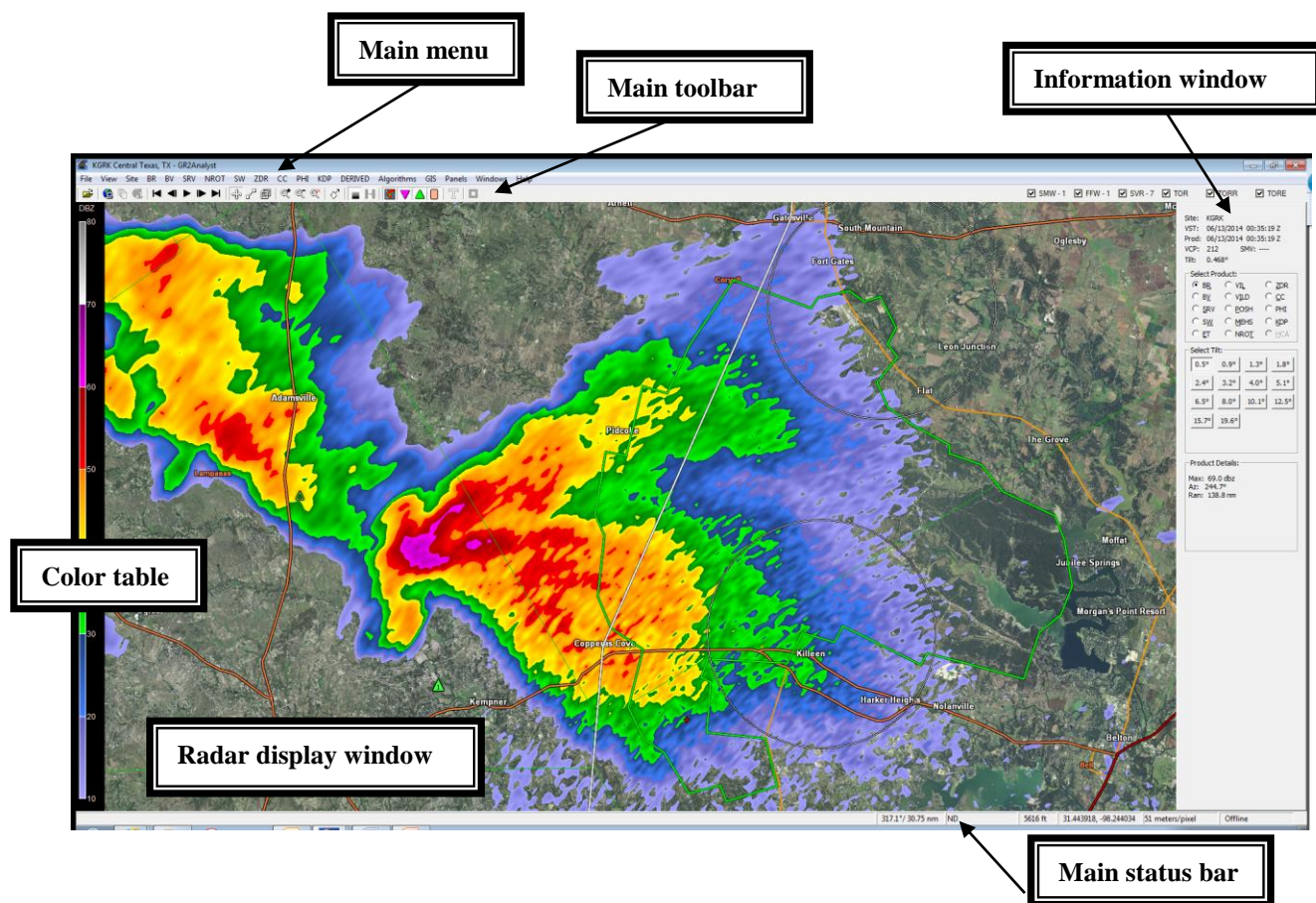
    c. Select the Start Archiver icon to download previous radar scans to create a loop; the default is one hour of data.

2. **Selecting Different Products**. Select from the **Information window** or the **Main Menu**.

    a. **Select Product:** Selects one of the sweep types available: base reflectivity (**BR**), base velocity (**BV**), storm relative velocity (**SRV**), spectrum width (**SW**), echo tops (**ET**), vertically integrated liquid (**VIL**), VIL density (**VILD**), probability of severe hail (**POSH**), maximum expected hail size (**MEHS**), and normalized rotation (**NROT**).

    b. **Select Tilt:** Selects one of the tilt angles available in the current volume scan. When live polling, the latest volume will contain a mixture of tilts from the current volume scan and the previous volume scan. Tilts from the previous volume scan will have an underscore under the first digit. For products without multiple tilts (i.e., echo tops), this area will be blank. (**Refer to Attachment 3 to this SOP for specific VCP information).**

3. **Navigation in the Radar Display Window.** Accomplished from the Toolbar Window.
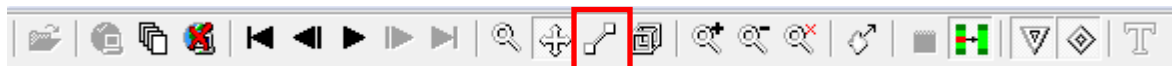

Toolbar Window
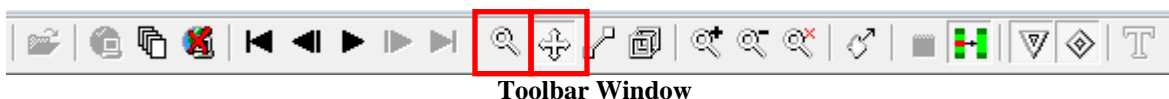
    a. **Mouse Mode:** These icons set the mouse mode and the mouse cursor changes to indicate the current mode.

    (1) The icon selects Zoom Mode. Position the mouse cursor in the radar display to the center of the area you want to zoom then left click and drag outwards to select the zoom area. Release the mouse button to complete the operation. To cancel a zoom operation in progress, press the Esc key while holding the mouse button down.

    (2) This icon selects Pan mode. Left-click in radar display and move the mouse to slide the radar image in any direction.

    b. **Zoom in, Zoom Out, No Zoom.** These icons perform a single-click zoom in, zoom out, and no zoom command. Center of the radar display is used for zoom in and out. No Zoom centers the display on the radar site and sets viewing radius to maximum.

4. **How to Create a Cross-Section.** This is done from the Toolbar Window.

Toolbar Window

a. Select the diagonal line icon to select the Cross-Section mode.

(1) Left-click on the first point in the cross-section line and drag out to complete the cross-section line.

(2) When the mouse button is released, the Cross-Section window will appear.

(3) Click and drag to move around the display; use the scroll wheel on your mouse to zoom in and out.
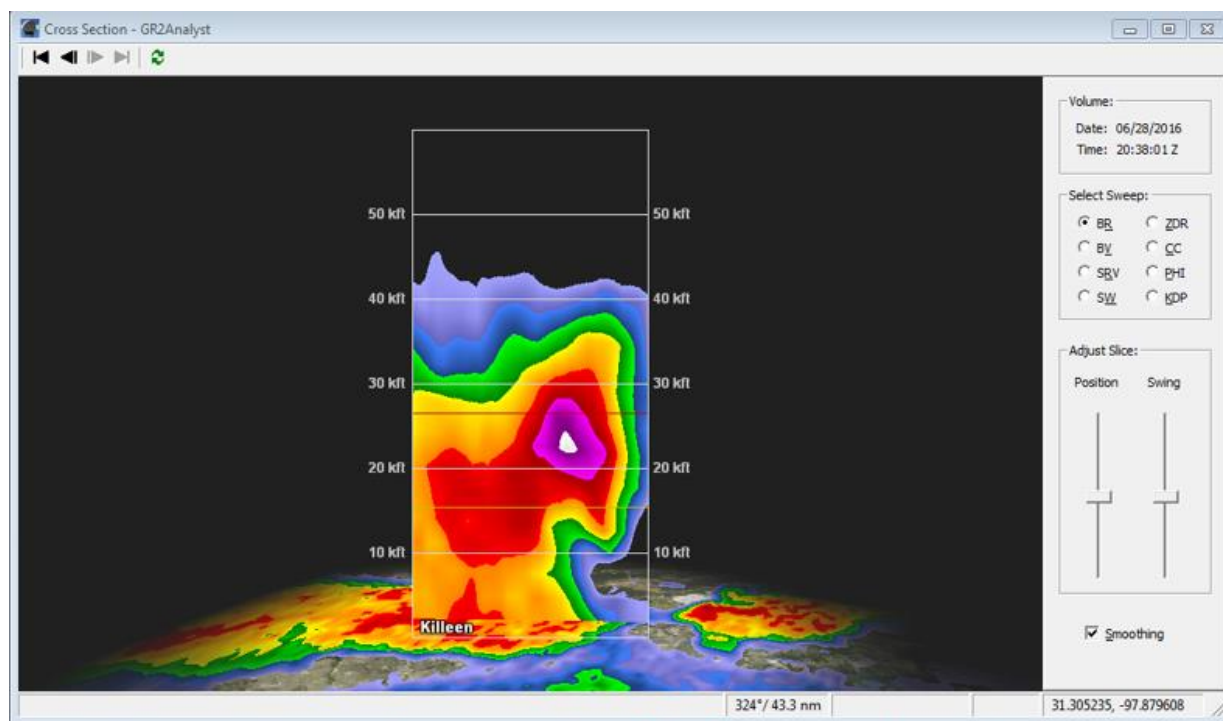
Cross-Section Window

b. Options available on right-hand side of the cross-section display:

(1) **Select Sweep:** Allows selection of which radar product to view.

(2) **Adjust Slice:** Move the Position bar to slide the vertical cross-section back and forth. Move the Swing bar to turn the vertical cross-section about a point.

(3) **Smoothing:** Toggle the smooth view off and on.

IMPORTANT: Refer to *3 WS Radar Interpretation Guide* for specific information on techniques/rules for creating cross-sections.

   c. **Cross Section Display.**

      (1) Height bars (10,000 foot intervals) are located across the cross-section radar display.

      (2) The yellow line is the 0ºC isotherm height.

      (3) The red line is the -20ºC isotherm height.

NOTE: The **freezing level** and **-20C isotherm height** are imported into GR2A from the NCEP 32km RAP model (GFS overseas locations). The actual values can be viewed from the Main Menu--click on "Algorithms" and select Environment Settings...". **Empirical studies have shown when 20 - 30 dbz reflectivity at the -20ºC level lightning initiation may be imminent.**

5. **Set Storm Motion Vector** (**IMPORTANT**): GR2A displays level 2 radar data that has no storm motion data (does not include storm tracks); therefore, to get an accurate Storm Relative Mean (SRM) product, Echo Tops, and VIL values, storm motion must be manually set prior to proper radar interpretation/interrogation. **Three methods to set the Storm Motion Vector:**

NOTE: Storm Relative Radial Velocity (SRV) is Base Velocity (BV) with the average motion of all storm centroids subtracted out. SRV can be useful in finding mesocyclones or other circulation patterns. When storms move quickly, their own motion can mask circulations within the storm. The SRV product removes the storm motion and displays the velocity within the storm as if the storm was stationary.

   a. **Method 1:**

      (1) If you already know the general storm motion (Skew-T, VWP, radar trend), manually enter it from the Toolbar Window by selecting the Set Storm Motion Vector icon .

      (2) A popup window will appear. Manually input the Azimuth and Speed and select "Apply" and "OK." The Storm Motion Vector (SMV) will appear in the upper right of the Information Display Window. If SMV is not set, four dashes (----) will be displayed.
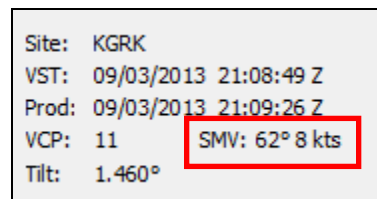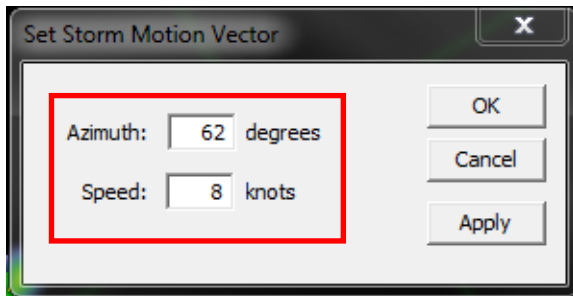
NOTE: Storm motion for single-cell thunderstorms can be estimated by using the mean wind in the lowest 5-7 km (below 23,000 feet) from a representative Skew-T.

b. **Method 2 (Set Storm Motion From Marker):**

(1) Find an easy to identify location of a storm on the radar display. Place the cursor over the point to be marked and right click on the point. Select "Place Marker Here" (Figure 1).
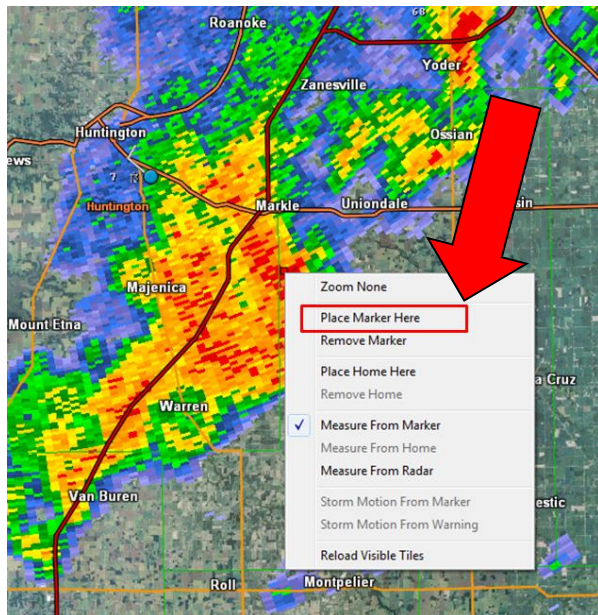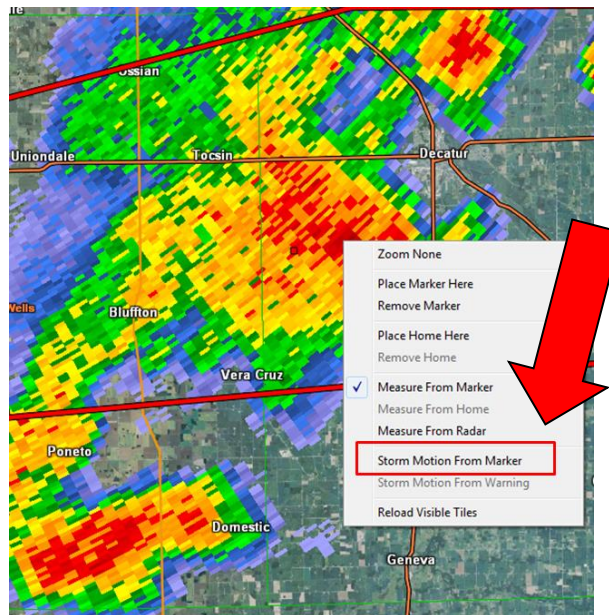

| Figure 1 | Figure 2 |

(2) A small red dot will appear on the marked location. Go forward in time one radar scan and right click on the location again and select "Storm Motion from Marker" (Figure 2). (Ensure "Measure from Marker" is checked otherwise the measurement will be incorrect.)

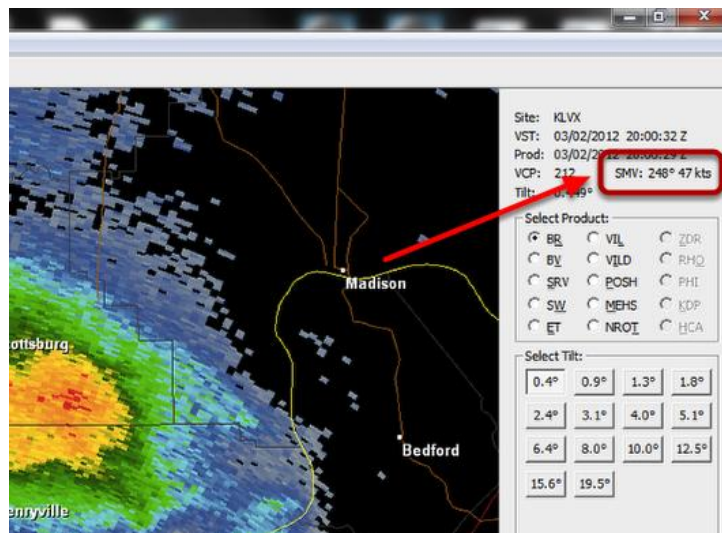(3) Storm Motion Vector will appear in upper-right of the Information Display Window (Figure 3).

Figure 3

c. **Method 3 (Set Storm Motion From Warning):**

(1) If NWS has already issued a Severe Thunderstorm or Tornado warning for the storm, just right click on the warning polygon and select "Storm Motion From Warning" (Figure 4)
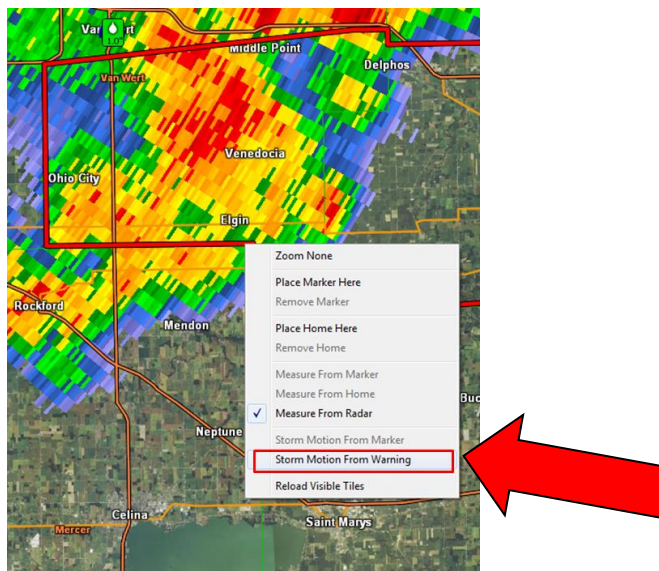

Figure 4

(2) Storm Motion Vector will appear in upper-right of the Information Display Window (Figure 3).

IMPORTANT: Storm Motion Vector (SMV) may have to be set multiple times during an event based on specific feature being interrogated and movement of the feature over time. Most cells and conglomerations of cells will generally move with the 700mb wind or the mean wind between 5,000 and 20,000 feet. Severe echoes are likely to move in a direction (0-45 degrees) to the right of this steering wind.

6. **Storm Track**. If you have set the SMV, you can right-click on the desired feature within the radar display and select "Storm Track Here" to place a storm track at the right-click point. The track is derived from the SMV and has tick marks every 15 minutes out to an hour. To remove the track, right-click and select "Remove Storm Track."
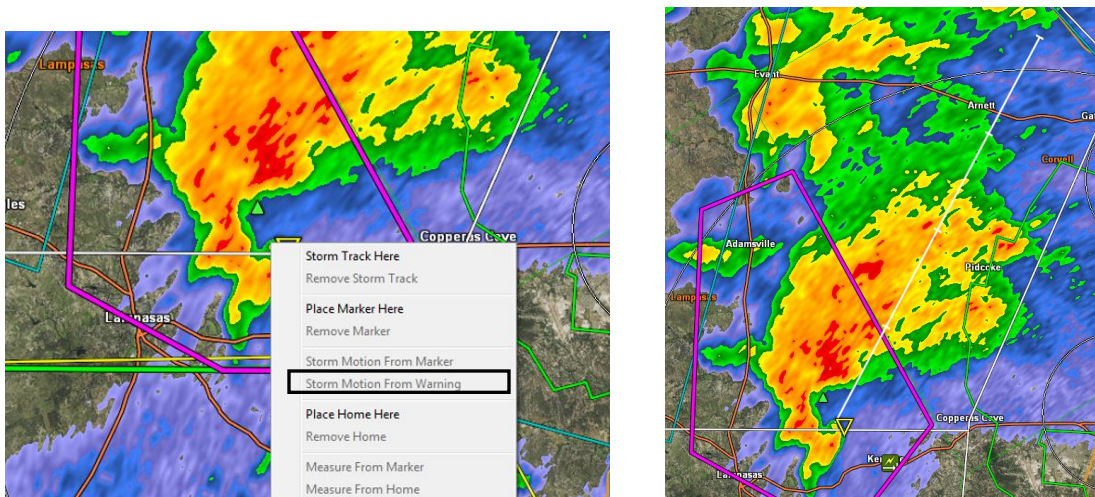
7. **Saving an Image.** You can save a screenshot of the entire GR2 Analyst window; the radar display, color scale, and information window; the radar display and color scale; or just the radar display.
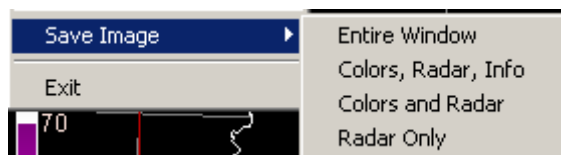
8. **Archived Data.** GR2 Analyst can display archived data from the NCDC NEXRAD Data Inventory Search **http://www.ncdc.noaa.gov/nexradinv/**.
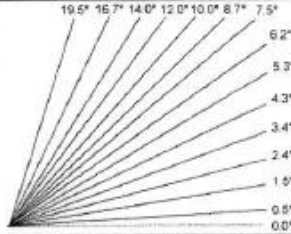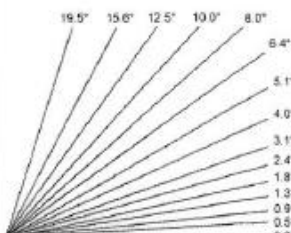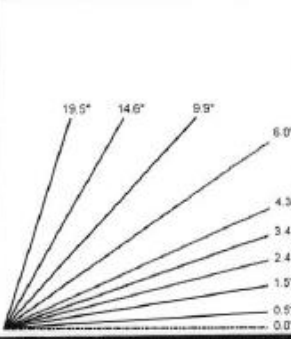
    a. Follow NCDC's archive data request instructions and once their E-mail is received, follow the instructions to view the archive data files.

    b. Save the files which you wish to view on to your computer.

    c. To view the data, unzip the files and open the files of your choice in GR2 Analyst.

9. On-line GRLevel2 Analyst User Guide **http://www.grlevelx.com/manuals/gr2analyst_2/**.

Quick Reference VCP Comparison Table for RPG Operators					February 2014
Slices	Tilts	VCP	Time*	Usage	Limitations
19.5° 16.7° 14.0° 12.0° 10.0° 8.7° 7.5° 6.2° 5.3° 4.3° 3.4° 2.4° 1.5° 0.5° 0.0°	14	11	5 mins	Severe and non-severe convective events. Local 11 has Rmax=80nm. Remote 11 has Rmax=94nm.	Fewer low elevation angles make this VCP less effective for long-range detection of storm features when compared to VCPs 12 and 212.
		211	5 mins	Widespread precipitation events with embedded, severe convective activity (e.g. MCS, hurricane). Significantly reduces range-obscured V/SW data when compared to VCP 11.	All Bins clutter suppression is NOT recommended.
19.5° 15.6° 12.5° 10.0° 8.0° 6.4° 5.1° 4.0° 3.1° 2.4° 1.8° 1.3° 0.9° 0.5° 0.0°	14	12	4 mins	Severe convective events. Extra low elevation angles increase low-level vertical resolution when compared to VCP 11.	High antenna rotation rates slightly decrease accuracy of the base data estimates.
		212	4½ mins	Rapidly evolving, widespread severe convective events (e.g. squall line, MCS). Increased low-level vertical resolution compared to VCP 11. Significantly reduces range-obscured V/SW data when compared to VCP 12.	All Bins clutter suppression is NOT recommended. High antenna rotation rates slightly decrease accuracy of the base data estimates.
19.5° 14.6° 9.9° 6.0° 4.3° 3.4° 2.4° 1.5° 0.5° 0.0°	9	21	6 mins	Non-severe convective precipitation events. Local 21 has Rmax=80nm. Remote 21 has Rmax=94nm.	Gaps in coverage above 5°.
		121	6 mins	VCP of choice for hurricanes. Widespread stratiform precipitation events. Significantly reduces range-obscured V/SW data within 230 km when compared to other VCPs.	All Bins clutter suppression is NOT recommended. High antenna rotation rates slightly decrease accuracy of the base data estimates. PRFs are not editable. Gaps in coverage above 5°.
		221	6 mins	Widespread precipitation events with embedded, possibly severe convective activity (e.g. MCS, hurricane). Reduces range-obscured V/SW data out to 300 km when compared to other VCPs.	All Bins clutter suppression is NOT recommended. Gaps in coverage above 5°.
4.5° 3.5° 2.5° 1.5° 0.5° 0.0°	5	31	10 mins	Clear-air, snow, and light stratiform precipitation. Best sensitivity. Detailed boundary layer structure often evident.	Susceptible to velocity dealiasing failures. No coverage above 5°. Rapidly developing convective echoes aloft might be missed.
		32	10 mins	Clear-air, snow, and light stratiform precipitation.	No coverage above 5°. Rapidly developing convective echoes aloft might be missed.

*VCP update times are approximate.